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Characterization of individual differences in "addiction score" and choice between cocaine versus palatable food choice in Heterogeneous Stock (HS) male and female rats

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Recent studies reported that when given a mutually exclusive choice between cocaine and palatable food, most rats prefer the non-drug rewards over cocaine. However, these studies used rat strains with limited genetic and behavioral diversity. Here, we used a unique outbred strain of rats (Heterogeneous Stock, HS) that mimic the genetic variability of humans.
We first identified individual differences in addiction-like behaviors (low and high). Next, we tested choice between cocaine and palatable food using a discrete choice procedure. We characterized the individual differences using an Addiction score that incorporates key features of addiction: escalated intake, highly motivated responding (progressive ratio), and responding despite adverse consequences (footshock punishment). We assessed food vs. cocaine choice at different drug-free days during acquisition of cocaine self-administration or after escalation of cocaine self-administration. We also assessed drug vs. food choice immediately after 1, 2, or 6-h cocaine self-administration. Independent of the addiction score, during a drug-free state (1 or more withdrawal days) HS rats strongly preferred the palatable food over cocaine, even if the food reward was delayed or its size was reduced. However, rats with high but not low addiction score modestly increased cocaine choice immediately after 1, 2 or 6-h cocaine self-administration.
Like other strains, HS rats strongly prefer palatable food over cocaine. Individual differences in addiction score are associated with increased drug choice in the presence but not absence (abstinence) of cocaine. The HS strain may be useful in studies on mechanisms of addiction vulnerability.